Robots, the Internet and Teaching History in the age of the NBN and the Australian Curriculum

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Have you ever wished you were Doctor Who and could pop yourself and your students into a Tardis and teleport them to an historical event or to meet a historical figure? We all know that unfortunately time travel is not (yet) possible, but maybe student and teacher teleportation just might be – sort of. Over the past few centuries and in lieu of time travel our communities have developed museums as a means of experiencing some of our history.

Many people around Australia would love to be able to visit our museums but unfortunately this is not always an option. They may live too far away from the museums they would like to experience and cannot afford the cost or time of the travel. They may be in an aged care facility and too frail to make a visit, they may be in hospital for an extended period of time or they may be cared for at home. For whatever reason, there is a desire to teleport people to our museums, let them experience the galleries and collections and interact with a museum curator, conservator, educator or guide.

Over the past fifteen years technologies to solve the teleportation issue have been rapidly developing. Of course we will not be able to really teleport a person's body, but maybe we can teleport their experience so that they feel in some way as if they are somewhere else. This technology is known as telepresence and you probably use a basic version, Skype, every week. The key enablers of telepresence are affordable computer and camera hardware, and a fast Internet connection.

A number of museums around the world have developed telepresence or videoconferencing (as it is sometimes referred to) education programs where a class of students 'visit' a special room in the museum without leaving their classroom. They interact live with an educator or curator at the museum, who tells stories, shows real artefacts and, crucially, answers questions and invites feedback from students. They sometimes use the Smart Boards that are becoming more common in classrooms around the country.

But what if you could do more than this and actually take the students around the galleries of the museum and break free of the shackles of traditional telepresence. We can now make video calls from our Smartphones but it is impractical for a museum-based educator to use such a small hand held device to simultaneously interact with students and show them the exhibits — enter a robot!

In parallel with advancements in the Internet computing and camera technology has been the advancement of autonomous robots. The Autonomous Systems Laboratory within the CSIRO ICT Centre is a world leader in field robotics research and has nearly twenty years' experience developing robotic solutions to interesting problems. The time is now ripe to combine the technology of autonomous robots, fast Internet (in the form of the NBN) and very high resolution 360 degree digital video cameras, and deliver a mobile telepresence experience that attempts to 'teleport' a class full of students into a museum.

As an Australian Government funded initiative, the Department of Broadband, Communications and the Digital Economy (DBCDE) and CSIRO are overseeing a two-year project to demonstrate a mobile telepresence system in the National Museum of Australia. The system is being initially deployed in the *Landmarks: People and Places across Australia* gallery, the museum's recently developed permanent exhibition with the most relevant connections to the *Australian Curriculum: History* (www.nma.gov.au/exhibitions/landmarks/home). A limited operation trial of the system will occur in February/March 2013 and will run until June 2013.

The project has been conceived as a learning opportunity which explores how technology and educational theory can be combined to bring a new and exciting live experience to museum visitors who can stay in their classrooms. The project demonstrates that a new way of visiting the museum is possible. The visits will be more focussed than a traditional physical visit to the museum, provide a valuable educational experience and be shorter in duration (around 40 to 50 minutes, the length of a typical school period). This will be an attractive option, not only for regional and remote schools, but also city schools that cannot physically visit for a variety of reasons, or schools that have visited but would like to conduct a virtual follow-up visit.

At the heart of the system is the idea that multiple students (up to twenty or possibly more if they are working in groups) can simultaneously use a single robot to explore the exhibition. This is achieved by the use of a special 360-degree field of view video camera that sits atop the robot. This camera sees the whole environment immediately around the robot and allows each student to experience an individual view. Combined with a camera constantly focussed on the educator, a special close-ups camera that the educator can pull off the robot, and two-way audio, students are able to experience a convincing state of situational awareness.

Robotics engineer Fred Pauling adjusts the omni-directional camera head of the robot

One of the key challenges for the National Museum of Australia and CSIRO has been to design education programs and experiences that exploit the new opportunities provided by the robot to excite students and stimulate learning. Our aim is to provide a compelling educational experience that is:

- interactive in nature by making the learning active rather than passive;
- a collaborative learning experience by encouraging students to interact with each other as well as with the educator or curator at the Museum;
- curriculum relevant, especially in relation to the developing Australian Curriculum;
- enjoyable and fun, by fostering student curiosity and interest about museum objects and the stories about Australian history that they tell.

We also anticipate that students will also be innately interested in the robot itself and how it works. This too will form part of the unique educational experience.

The *Landmarks* exhibition contains wonderful examples of primary and secondary sources, but what does this new type of access mean for you and your students in an *Australian Curriculum: History* classroom? It could mean an interactive tour for Year 9 that brings to life the consequences of the Industrial Revolution for Australia

in the nineteenth and early twentieth century. For Year 10s it could mean understanding the civil rights of Australia's Indigenous peoples. For a history teacher in a primary school it could mean exploring with Year 5s the role played by a significant individual or group in shaping the Australian colonies. Or for the history teacher looking for more creative way of teaching historical skills, the robot tour could be used to look at different types of evidence in history.

The user interface seen by a school student in her classroom

This is potentially just the beginning of the application of mobile telepresence experiences in cultural institutions and other places of learning outside the classroom. With the installation of Wi-Fi in museums and galleries throughout Australia becoming more common there is the potential for teachers and students to go almost anywhere at any time for educational experiences that are interactive, engaging and curriculum relevant. It seems that Doctor Who and his Tardis may not be pure fantasy after all.

We would like you to stay in touch with the mobile telepresence project as it develops at the National Museum of Australia over the next 12 months. Perhaps your school could become one of the trial schools. To keep in touch go to the National Museum of Australia's website and sign up to our education blog. http://nma.gov.au/blogs/education/ We are starting to post regular news updates about the project on the blog. You can also visit CSIRO's website at http://mbot.csiro.au for further information about the project.